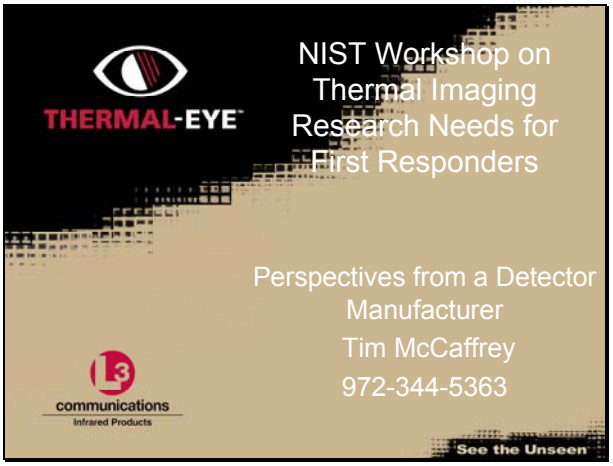
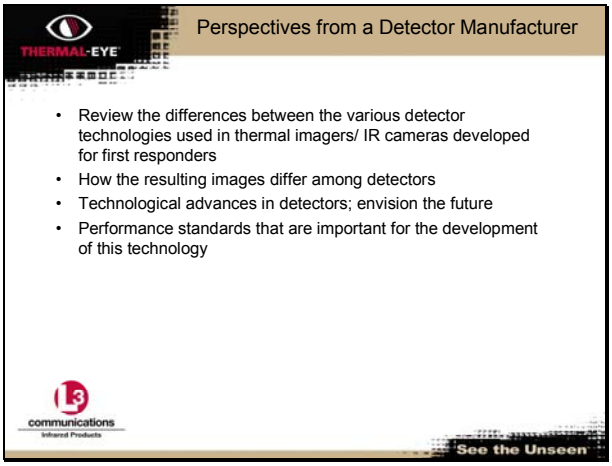
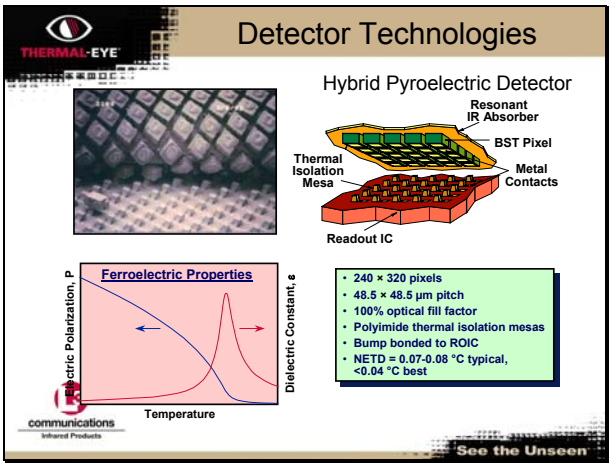
APPENDIX 3.F-

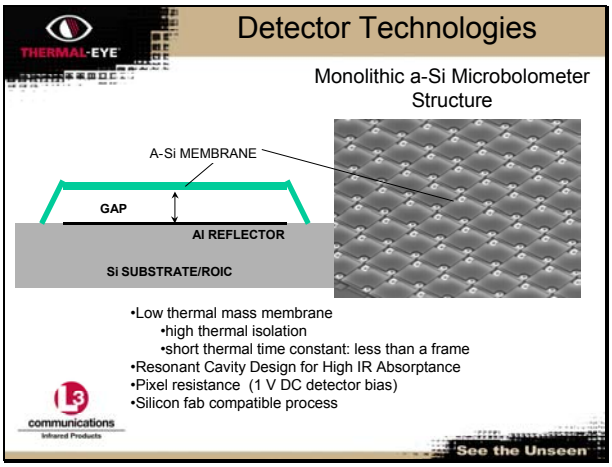
Perspectives from a Detector Manufacturer
Tim McCaffrey, Raytheon Commercial Infrared

Imaging Core makers have promoted Pyroelectric sensors and MicroBolometers for use in the Fire Service/ First Responder applications. Basic utility is now satisfied. For tomorrow, makers are focusing on smaller, more efficient engines creating sharper more informative images. Fruitful areas for study remain mainly in characterizing features of an image which cue the user or which enable greater utility and application. Future users must consciously stay in step with commercial motives to assure the widest availability of thermal imaging.









Comparing Existing Technologies

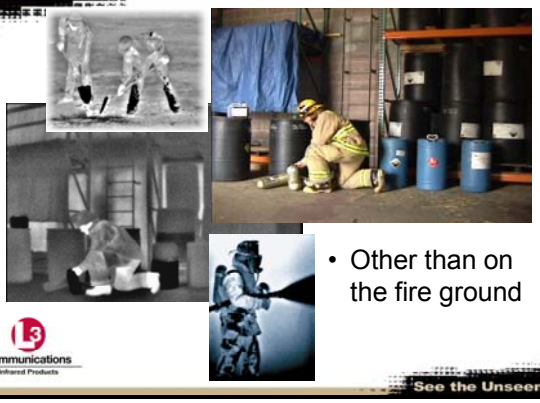
Bolometers …

- have demonstrated excellent potential for low NETD
- have essentially ideal MTF
- are monolithic and producible
- are limited by spatial noise
- But require occasional "touchup"
- But require factory calibration
- But require precision A/D converters, multiple-field memory, substantial processing capability

Pyroelectrics …

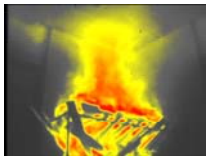
- have minimal spatial noise
- robust in highly variable scene and ambient environments
- require lower-bit A/D converter
- have low MTF
- But requires temperature stabilization
- But pixel size is not readily reducible
- But improvement potential is relatively low

Image differences



- Other than on the fire ground

Image attributes



- Glare obscures figures
- Detail lost in the shadows
- Is the un-burning wall a risk?
- Note the thermocline above the rescuer's Head
- See body and room detail in the presence of flame

Advances in Detectors

OEM set priorities for core makers
Reduce camera, FPA and optics size, weight and cost
320x240 advancing to 1024x768
NETD's approaching 20mK
Reduced smear; smoother images, crisp images
Scene temperature ranges over 1000F
Ambient conditions from –40C to +85C
Power at the core under ½ Watt

Performance Standards

- Dynamic Range management
- Wavelength of operation
- MRT vs. NETD et al
- Response of the eye to
  - Spatial noise
  - Temporal noise
  - Clarity, crispness
  - Contrast
- Performance at ambient extremes
  - Endurance at temperature
  - Startup
  - Stability of the Optics
  - Scenes colder or hotter than the camera
- Impact on domestic vs. International mkt.